Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	EB Docket No. 04-296
Review of Emergency Alert System	)	

REPLY COMMENTS OF

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The author of this reply, Kendall Post, Chief Technology Officer of Alert Systems Inc., has undertaken unique studies and technical work over the last 7-years that are relevant to EAS rulemaking. The data underlying this work was gathered from off-the-record discussions with emergency managers, after-incident reports, homeland security strategies, informal surveys, public safety and hazard mitigation conferences, research papers, disaster news accounts, federal reports, and other sources.

The author was a founding member and trustee of the *Partnership for Public Warning* and is acknowledged in the federal report, *Effective Disaster Warnings*[1] (OSTP, Nov 2000).

The author acknowledges the Commission's preference that parties track the organization set forth in its NPRM in order to facilitate the Commission's internal review process. Because the author addresses the need for an integrated, seamless national emergency communications and public warning system, he raises issues not specifically identified in the NPRM. In order to facilitate the reader's understanding, he hereby presents his comments in a narrative sequence, which may make his response more easily understood. Two cross-reference tables of contents are found on pages 20 ad 21. Table of Contents-I will help the reader correlate the NPRM paragraphs to the author's recommendations.

Need for Improvement (NPRM paragraph 20, 21, 31)

[1] Effective Disaster Warnings, Working Group on Natural Disaster Information System, Subcommittee of National Science and Technology Council, released Nov 8, 2000, http://www.fema.gov/pdf/rrr/ndis_rev_oct27.pdf

Regarding the primary NPRM question of whether the EAS is suitable in present form or should be upgraded, the federal report, *Effective Disaster Warnings* states, "*The major problem in modern emergency management is the [lack] of an effective warning system that reaches every person at risk ... no matter what they are doing or where they are located*."

Collected study data supports this statement. It shows serious weaknesses in the nation's public warning systems even when all systems are used together. In an email survey, the author asked Emergency Managers (EMs) to estimate the percentage of the public they could alert within 15 minutes for a major threat. EMs with jurisdictions of 5.5M people estimated maybe 23% at 3AM and perhaps 40% at 10AM. Subsequent disaster events show these percentages to be significantly optimistic.

EMs told us the efficacy of existing systems including EAS is being undermined by 'tight' building construction methods, Satellite TV, the Internet, movie rentals, mobile lifestyles, and call screening. When the color of the sky does not pre-sensitize people to a threat or when the threat is colorless or odorless, the accessibility of the public is considerably more problematic. People who are deaf and hard-of-hearing, staying in hotels or campgrounds, living in rural areas, or working in factories and warehouses, and shopping in malls are unreachable on short notice with any certainty. And when utility power fails, all bets are off.

At a June 2004 conference sponsored by the Partnership for Public Warning, a Florida Emergency Management (EM) official doubted he could reliably reach even 5% at 3AM. In show of hands, all voting attendees rated existing systems inadequate or worse.

Clearly, the nation's public warning capabilities need improvement.

We agree with the PPW (NPRM paragraph 21) on the general need to retain radio / TV warning capabilities. Clearly, many people do get notice of weather threats and these do save lives. Fortunately, a good percentage of tornadoes and major weather events occur at times of the day when people are watching TV. Radio and TV do a good job of sensitizing people to potential or emerging threats.

We disagree somewhat with the PPW, however, on how to improve public warning methods. We have the benefit of studying public warning issues within the larger system and processes of disaster management. These studies show that current public warning systems hinder certain critical emergency management processes. They block adoption and usage of other important EM technology and real-time methods. They show that public warning issues must be considered within the larger framework of the nation's overall emergency information highway.

Recommendation 1. The FCC should first seek to:

- **Develop a general sense of what public warning performance is feasible.**
- **Establish an objective means for judging various technical solutions while maintain 'technology and vendor neutral' obligations.**

Everyone who has studied the nation's public warning systems agrees that improvements are mandatory but how much of an improvement is needed? Is 5% OK? Is a 20% improvement sufficient? Or should we be seeking to reach 90% of the public within 15 minutes 24/7 under all conditions, and to achieve this effectiveness in 5 years?

Since we have no comprehensive performance data or performance metrics by which to gauge existing systems, relative improvement goals are meaningless. And if we have no deadline for achieving those performance goals, does any performance goal have any value?

Until goals are set, we can argue endlessly about whether it's better to patch existing systems or adopt new technology. And the present lack of any clear objectives will continue to favor the status quo.

Further, we have to ask who should set these goals? Those who have vested interests in existing systems or those who can maximize public safety by objectively factoring all needs and issues of all stakeholders before applying technology?

And over the long term as science and technology advance, who should maintain those goals? What, if any, organization is fully representative of all stakeholders?

Recommendation 2: During EAS rulemaking, the FCC should factor the needs and perspectives of all 8 major categories of stakeholders.

- Federal government
- State government
- Local EM agencies
- Technology providers (communications carriers, innovators, equipment providers)
- Organizations with risk / liability interests (risk pools, insurance, hazmat manufacturers, nuclear power)
- Organizations with research / education / policy missions
- Auxiliary service providers (Red Cross, Search & Rescue)
- Public / public advocates (deaf, elderly).

Recommendation 3: The FCC should adopt the 5 critical principles / operating practices for assessing EAS options.

- Incident Command System
- Agility of resources (interoperability of people and equipment)
- Systems engineering (economies of scale, reliability, maintenance, recovery)
- Readiness (training, technical support, human factors)
- Public / private partnership (work to respective strengths)

Critical Obstacles to Progress

The author's studies reveal 4 long-standing obstacles - 3 strategic, 1 performance / operational - to improvements of the nation's emergency information highway, including

its public warning sub-systems. Certain of the following recommendations address these specific obstacles. They apply to the EAS, as the EAS is part of this vital information highway. Others recommendations are specific to the EAS. All of the recommendations herein reflect the collective wisdom of the 8 categories of stakeholders cited above, weighted by the 5 critical principles / operating practices also cited above.

Recommendation 4: The FCC should favor aggressive performance goals (NPRM paragraph 31) for the nation's *overall* public warning solution that best:

- **Enable local EM agencies to use advanced incident management technologies and methods.**
- **Foster formation of a seamless national incident management system in which local EMs can be fully empowered and maximally responsive.**
- **Also facilitate external resource mobilization and local interagency notification activities.**

Many local EMs question the value of advanced methods and improvements elsewhere in the nation's emergency information highway when they can't reliably reach all of the public at all times. In addition, local agencies generally need 8 to 15 minutes to execute warning, mobilization and notification activities at the onset of relatively common events like tornadoes. These timeframes are already too long to add threat and evacuation route modeling to initial activities, and to use them in real-time.

EMs say that once they have a sufficiently effective and efficient warning / mobilization capabilities, they do want, and can use, an integrated command system whereby duty staff, sometimes a single individual, can manage activities. Collectively, they describe a system that is somewhat comparable to the 'battle management' terminals used by U.S. military field units. They want situation awareness, threat and damage assessment, consequence management, and other capabilities that operate in real-time.

The effectiveness and operational efficiency limitations cited above and in earlier paragraphs suggest general performance and procedural time goals. They suggest that improvements of public warning systems inclusive of the EAS be sufficient to enable general usage of real-time decision-aiding tools. They suggest the nation's emergency information highway inclusive of all public warning sub-systems be adequately connected and integrated. They show that compromise solutions are very unlikely to produce meaningful benefits.

Recommendation 5: The FCC should gauge the effectiveness of the overall public warning solution, and EAS options by 3 essential attributes (highlighted) and associated features (bulleted, partial listing). The degree to which warning systems meet the features determines the likelihood of message delivery, tolerance of message intrusion, and acceptance of / action on the message.

Immediate *(Speed of warning delivery)*

- Minimal bandwidth (one broadcast message gets everyone).
- Distinctive alert (separate from other information, music, etc.).

- Urgency coding. (No tone for testing, distinct patterns and amplitudes [max of smoke alarm]).
- Situation presented concisely.
- Appropriate response recommended concisely.
- If text display, large characters, backlighting.
- Message retention (coming indoor after yard work, etc.).
- Message replay by listener control.
- Auto-delete expired messages (minimize extraneous info).
- Message recall mechanism.

Strategic *(delivery to specific geographic area and/or audience)*

- People associated by geography (polygon, ellipsoid, altitude, FIP, etc., conforming to affected population) but possibly dislocated from that area.
- Audience associations (language, school of children).
- Audience associations (function, rank or certification level, industry category, and other affinity info for mobilization).
- Combinations of the above.
- No alert duplication for messages having overlapping geographic areas.
- Dynamic broadcast area to reach dislocated people.

Assured Reach *(of the public by EM officials)*

- Deliver to people where they live, work and play.
- Deliver to people in transit.
- Always enabled.
- Operates for at least a day after power fails.
- Minimal standby power consumption (EPA).
- Can drive local area (factory) sirens, aids used by deaf (NPRM paragraph 36, 37, 39), electronic signage, computer networks.
- No subscription accounts of service fees for public.
- No user database needed by public safety organizations.
- Signal penetration into buildings.
- Non-blocking 'last-mile' channel.
- Voice presentation option (text-to-voice synthesis).
- Direct access (no human intermediaries – speed, automated stations, human error, liability) to warning / mobilization channels by EM authorities.
- Individual messages tailored to specific area and / or audience.
- No message duplication (warning fatigue).
- Alert tone falls to occasional soft chirp if unread message (unoccupied apartments, return from shopping).
- Warning / mobilization / notification receivers self-locate best signal channel.
- Delivers information during training, preparedness, response and recovery phases of disasters.
- Infrastructure can be quickly rebuilt.
- Text-to-voice synthesis option. (NPRM paragraph 39)

The list above poses a major dilemma for the FCC. It's simply not practical to mandate all of these features, much less meet myriad economic and technical issues, for all types of services.

Accepting the need for some EAS warning capacity, the options include: 1) maintain a lowest common denominator combination of features for all services, 2) favor different features for different types of services, or 3) support an entirely new system.

The lowest common denominator approach provides minor improvements in warning system effectiveness at best so long as the public uses analog services. The second approach, different features for each type of service, raises difficult problems of unequal burden / competitiveness and consumer device replacement so as to gain some unknown, but probably limited, improvement in warning effectiveness.

Recommendation 6: The FCC should adopt a multi-part strategy.

1. **Establish a new, lowest-common-denominator standard (NPRM paragraph 4) as described herein.**
2. **Set a technology transition (like NTSC to HDTV) date (perhaps 5-years) for this new standard (NPRM paragraph 30).**
3. **Support a new, low-bandwidth public warning system (NPRM paragraphs 4 and 32) that:**
    - **Has all of the attributes and features of Recommendation 5,**
    - **Delivers the essential basic information as it applies to the affected populace, and**
    - **Lets individuals supplement the essential basic information with whatever additional means they prefer or find available.**

Our investigations show that this multi-part strategy is the only realistic means for significantly improving the effectiveness of public warnings.

Broadcasting, by EAS or other means, is not an optimal public warning method in all situations. Consider a major bio-terrorism attack in the Washington, D.C metro area. Mass evacuations due to wide area warnings will overload transit resources despite shelter-in-place policies for federal offices. Staged evacuations may be necessary. It may be desirable to notify only those people at immediate risk 3 minutes before everyone else.

When geographically specific information is broadcast, some people cannot visualize their geographic position relative to the threat area. Others may be visitors or otherwise new to the area and not recognize geographic landmarks. And geographic specificity is sometimes sacrificed or generalized when warnings are broadcast on short notice.

Recommendation 7: The FCC should reject automatic turn-on and forced-tuning to another channel suggestions (NPRM paragraphs 30 and 35). It's extremely unlikely that the public and EMs would fully embrace any EAS solution unless it has **all** of the attributes and features listed in Recommendation 5.

Geographic specificity is perhaps the greatest public warning challenge. Despite *Specific Area Message Encoding (SAME)*, day care providers and other people complain about duplicate and non-applicable messages. People who are deaf have largely rejected pagers as public warning devices for lack of geo-targeting capabilities. "I got tired of being alarmed for messages that didn't apply to me on my side of town, especially at night."

People don't like solutions that don't immediately differentiate between system tests, serious threats and duplicate warnings. Mothers bathing infants and operators of factory equipment resent the need to run to the TV only to find that the alert tone indicates a test.

Auto turn-on and forced tuning methods by themselves don't address external resource mobilization, local interagency notification, multiple language, altitude (flood plain, high-rise buildings), urgency coding, uninterruptible power, and other 'last-mile' communications issues.

Auto turn-on methods require continuous receiver operation. In some consumer devices, the additional power consumption would be significant and runs counter to EPA 'green' energy conservation and standby power reduction initiatives.

Recommendation 8: The FCC should treat the EAS as but one part of the overall 'last-mile' public warning solution or PAW (NPRM paragraphs 32 and 33). A greater number of fault-tolerance and backup strategies are available when various systems are considered within a larger, integrated public warning solution.

A systems engineering perspective should be applied to the nation's overall public warning solution including the EAS. Various media provide different information presentation options. But increasing bandwidth generally comes at the expense of greater susceptibility to utility power failures and longer infrastructure recovery times. Ignoring these and other factors has serious consequences. The residents of Spencer, SD received no tornado warning before their town was leveled in 1998 because the tornado first destroyed the power distribution lines to the area.

Recommendation 9: EAS rulemaking should specifically favor unified connectivity (wired and wireless) solutions for local EM agencies. EM agencies with all-hazard missions tell us repeatedly they need integrated all-hazard solutions. They have myriad connectivity needs - to sensors and human intelligence, to critical infrastructure, to mutual-aid partners, between various knowledge formation computer tools, to all 'last-mile' warning and mobilization channels, to private sector disaster suppliers and equipment vendors, etc, etc.

For tax base, training, technical support, operating, and various hidden cost reasons, local agencies now have to pick and choose amongst many partial connectivity solutions. As a result, the market size for any particular solution is very limited. Because the market is limited, solutions are semi-custom and costly. In this pick and choose environment, rules that favor an EAS connectivity solution that is not integral to an overall connectivity

strategy may force compliance but at the expense of other connectivity needed by local agencies.

Fragmented, independent and partial solutions pose large logistical / interoperability problems in major calamities. These problems complicate unified incident command efforts. They contribute to human errors. They make it impossible to transfer all operations from a damaged local EOC to another (NY, Sept. 11, 2001), or to establish a fully interoperable virtual or field EOC on short notice. To overcome these kinds of problems, the Dept. of Defense and NATO use standardized munitions. And NOAA uses the same Advanced Weather Information Processing System (AWIPS) terminals in all forecasting offices.

Fragmentation inhibits readiness. Experienced EM officials say they can't rely on systems and tools that aren't used or trained with regularly (NPRM paragraph 44). Integrated connectivity solutions that include the EAS are more likely to be used on a regular basis because they'll be used for routine situations – lost child, hostage, industrial fire, etc. In addition, unified, or at least semi-standardized, connectivity solutions allow greater flexibility (interoperability) of people at the onset of disasters when numbers of duty staff can be very limited.

Recommendation 10: FCC rulemaking should treat public warning systems, including the EAS, as just the 'last-mile' of the overall emergency information highway that produces public warnings. All elements of this highway need to be tightly connected for responsiveness, logistical, fault-tolerance, human error, and other reasons.

Within the overall information highway, we see important new roles for data-casting and other digital capable services that are otherwise limited in value by their 1-way communication flow. (Information must flow laterally and up-chain for threat recognition and other incident management reasons.)

Recommendation 11: The FCC should call for a master infrastructure plan that fosters a *seamless* national emergency information highway. A master plan is desperately needed so stakeholders can overcome a sea of interdependent needs, priorities, mission constraints and interoperability concerns to define and delineate respective efforts. It's needed to minimize duplication of effort and unlock unspent federal appropriations for state and local domestic preparedness.

For lack of a master plan, the communications systems and information technology tools comprising the nation's emergency information highway are fragmented, non-interoperable, unreliable and obsolete. In turn, all core processes of emergency management - data gathering, information management, knowledge formation (analysis, visualization) and knowledge dissemination (public warning, mobilization, interagency coordination, supply chain management, etc.) - are slow and otherwise problematic at the incident management level.

Recommendation 12: The FCC should favor an Incident Command System (ICS) Internet backbone (wired and wireless components) to network all elements of the nation's emergency information highway, including the EAS (NPRM paragraphs 27 and 33). The ICS Internet backbone addresses all of the EAS connectivity concerns in NPRM paragraph 27 at small incremental costs.

An ICS Internet is already easily justified. The integrated command tools and local warning / mobilization systems of local EM agencies have to be networked to build the capability for dealing with catastrophic terrorism and other overwhelming disasters. The National Incident Management System (NIMS) document issued by DHS in March 2004, and other domestic preparedness goals imply this national incident command capability.

Internet infrastructure is already capable of supporting data, audio, and video with a multiplicity of compression methods and protocols. It supports large-key encryption methods and tunneling protocols for security and anti-spoofing. It needs to be 'hardened' for reliability in disaster situations but hardening methods are known - satellites, data-casting channels, amateur packet radio, and other means. It also needs to be 'hardened' against hackers but again the methods are known or being developed – secure tunneling, trusted platform architecture by the computer industry, IPv6 protocol, gateways and portals with firewalls, etc.

With the ICS Internet, a common personal computer (NPRM paragraph 28) with suitable access control, encryption and tunneling capabilities could connect a Governor, County Executive; Mayor, regional EM spokesperson, local EM official, as well as the President to the JIC/JIS or incident management team and the public on short notice from anywhere. Each of these officials is either performing the Public Information Officer (PIO) role or reinforcing the PIO in the Incident Command System that has now been institutionalized by NIMS.

Recommendation 13: Regarding activation of the national-level EAS (NPRM paragraph 13), the FCC should consider the implications of an event that destroys Washington and triggers leadership succession rules. The nation is divided into 10 governmental units (and FEMA management regions) having authority to reconstitute national government in catastrophic situations. It would seem prudent to consider national and regional level activation from alternate locations.

Recommendation 14: With the ICS Internet, the FCC should mandate (NPRM paragraph 24) all services (NPRM paragraph 29) to support the new EAS functionality (NPRM paragraph 28) on all program streams (NPRM paragraph 30) as detailed later. With the ICS Internet, a common computer with suitable decryption and tunneling protocol capabilities could drive radio, TV, HDTV, DARs, DBS, DAB, Cable, TV over Cellular, weather radio and yet to be developed communications services. The ICS Internet would provide a sufficiently economical connectivity solution for all. (NPRM paragraph 45)

Recommendation 15. With the ICS Internet, the FCC should abandon Local Primary (NPRM paragraph 17), state primary and secondary (NPRM paragraph 18), and daisy-chain signal relay methods (NPRM paragraph 27). Fixed EAS station relay linkages are too inflexible for some emergency situations that require locally specific instructions. Because the EAS system inconveniences so many people not directly impacted by the situation, many local EMs are reluctant to activate the system.

The value of state structures is questionable. Major calamities - tornadoes, floods and wildfires - routinely cross state lines. A number of major metro areas - D.C., Chicago, New York – extend into multiple states. Per the National Incident Management System (NIMS per DHS, March 2004), regional areas must be capable of operating under unified Incident Command System principles.

The current EAS signal relaying methods are too vulnerable to spoofing (NPRM paragraph 41). The denial of service and other vulnerability of the Internet are addressed in the ICS Internet proposed herein by hardening (network segregation, satellite links, secure network gateways, 2-factor authentication access methods, redundancies, and other known methods).

Recommendation 16: The FCC should favor uniform operating practices and drop state EAS plan requirements (NPRM paragraphs 24 and 25). With the ICS Internet, EAS connectivity is sufficiently universal that differences in state EAS programs should be minimal and largely operating practice issues. Interoperability of people in unified incident command system situations and metro areas that straddle multiple state jurisdictions favor common national plans and operating practices.

Recommendation 22 advocates a public / private partnership that is tasked with maintaining a national master plan and best practices. Partnership responsibilities should include EAS operating practices.

Recommendation 17: The FCC should drop EAS header codes (NPRM paragraphs 19 in favor of Internet protocols, namely XML and XML Schema (CAP per NPRM paragraph 33). EAS codes have historically lagged new threats. And local EMs say the codes don't support unique local problems that arise from time to time. An EM in northern Wisconsin cited a situation where a bear was roaming a city. NORAD has long wanted a means to flash asteroid warnings before occasional high-altitude disintegrations trigger thousands of calls.

The use of Internet protocols completely eliminates mandatory / non-mandatory event code, EAS equipment updating, and update funding issues raised in NPRM paragraph 28.

Short EAS codes allow warnings to be transmitted through analog communications channels with audio frequency-shift keying methods but virtually all major communications systems developed in the last 15 years use digital modulation methods.

EAS codes represent both type and magnitude of threat – Tornado Warning. Type and magnitude have to be separated so people can better differentiate between very serious but low probability threats, and very serious and immediate threats People who are operating heavy equipment need to know whether to initiate an 'emergency' (very expensive) or orderly shut down of the plant.

Type and magnitude should also be separated for warning prioritization reasons. Local EM officials have to prioritize warnings and other risk communications in overlapping emergencies. A locale may be confronted by a tornado at the same time the President needs to speak concerning a bio-terrorism attack on major metro area. The tornado may be a more immediate threat to the local populace. Digital computers and XML protocols together would permit a short delay of a Presidential statement to insert a tornado warning if necessary.

The message priority issue also begs for better geographic and audience targeting of all emergency communications including situations requiring EAS activation for a Presidential statement. This point is supported by the recent assignment of different Homeland Security Advisory System color levels to major East Coast cities and the rest of the country. Disaster areas rarely conform to pre-defined geographic areas that are assigned *Specific Area Message Encoding (SAME)* descriptors (NPRM paragraph 14)

We suggest the XML based Common Alerting Protocol (CAP) standard (NPRM paragraph 33) be considered as a starting point for EAS code replacement. We say 'starting point' because the CAP lacks mechanisms for mobilizing external resources and facilitating certain local interagency notification activities. As noted earlier, warning, mobilization, and notification, collectively, have to be made more efficient before local EMs can make general usage of certain advanced capabilities.

Internet protocols, a human interface using computer technology, and unified connectivity per Recommendation 9 would alleviate many of the training and equipment familiarity concerns raised in NPRM paragraph 44.

Note: The ICS Internet and the XML-based Common Alerting Protocol, together, address EAS / NWS interoperability concerns in NPRM paragraph 14. It would also alleviate the emergency carriage problem cited in NPRM paragraph 18.

Also, a number of local EMs has indicated to us that the 80% weather event activation statistic cited in the Notice of Proposed Rulemaking is misleading. Local non-weather usage of weather radio would be considerably higher if the system had all of the features cited in Recommendation 5. So long as NWS lacks sufficient geographic specificity and other features, local agencies are reluctant to activate in industrial fire, school shootings and other non-weather situations. Without these features, NWS disturbs too many people unnecessarily, particularly the elderly and infirm, and especially at night.

Recommendation 18: The FCC should adjust the EAS mission to include all phases of disasters as required for a comprehensive master plan. The EAS was originally

envisioned as a last resort warning means in case of nuclear attack. But in some catastrophic terrorism situations, the President's voice may be needed to help gain compliance with a quarantine order. Under some catastrophic circumstances, EMs should have some guarantees of access during response and recovery phases of disasters.

Recommendation 19: The new basic EAS rules (NPRM paragraph 28) should mandate the following.

Information Provider / Originator Obligations
The offices of President and Governors, weather forecast office, local EM and other local emergency information sources should be connected to the ICS Internet, directly or through secure gateways. They should issue audio warnings in XML or streaming formats, and optionally, video in XML and streaming formats. They should also issue XML tagged data including icons, text strings, 5 level message urgency coding from text to immediate life threat with associated distinctive alert tones, affected geographic area (polygons, ellipsoids) including altitude, expiration time, and other information as indicated in the attributes / features list cited earlier.

Information providers will use best efforts to follow best-practices. A best-practices document will specifically address duplicate and incrementally changing (storm cells) messages.

Concise and Verbose XML text, audio and video announcements will be supported. Optional Verbose information will follow Concise information. Verbose information is intended to support news / weather broadcasts and those services wishing to provide supplemental information.

'Last mile' Channel Head Obligations
Program origination / head-end facilities of various services should be connected to the ICS Internet through secure gateways and be capable of receiving information as described in the Source Obligations section.

We suggest the various services be obliged to carry this information as follows:

- *Satellite TV and Cable Systems – Non-Local Channels*
    - Immediate life threat situations (warnings) or imminent threat situations (watches) affecting more than 10% of population in signal coverage area (serviced by individual transponders and spot beams) or 20% of signal coverage area (serviced by individual transponders and spot beams) of individual head-end equipment:
        a) If concise XML audio received and until expiration, display icon, and play warning or watch alert tone per urgency code, scroll XML text and play concise XML audio (and video if available), repeat text scroll at maximum intervals (5 minutes to 2 hours) as specified by information source, and repeat alert tone and concise XML audio (and video if available) at a

different maximum interval (typically 5 or 6 times greater than text) as specified by information source.

b) Station announcers may verbalize warning audio in a).

c) If streaming audio received (announcement by President, Governor, etc), display icon (suggest President, State or Local Gov seal), play warning or watch alert tone per urgency code, scroll XML text if provided, and play audio / video stream.

- System Test:
  a) When urgency code indicates test but no text, audio or video, display EAS icon for 5 seconds.
  b) When urgency code indicates test, and text or audio or video is also received, play test alert tone, scroll XML text, and/or play audio / video once. (Tone and audio / video together run 5 seconds max.)
- Response times: Watch / warning communications should be inserted into the programming stream within 1 minute. Test communications should occur within 5 minutes.

- *Local TV Stations including those rebroadcast on Satellite TV for local markets*.
  - Same as *Satellite TV and Cable Systems - Non-Local Channels* except 2% of population and 5% of service area.
- *Satellite Radio*
  - Immediate life threat situations (warnings) or imminent threat situations (watches) affecting more than 10% of population in signal coverage area (serviced by individual transponders and spot beams) or 20% of signal coverage area (serviced by individual transponders and spot beams) of individual head-end equipment:
    a) If concise XML audio received and until expiration, play warning or watch alert tone per urgency code and concise XML audio, and repeat at maximum intervals (typically 5 or 6 times greater than text) as specified by information source.
    b) If streaming audio received (announcement by President, Governor, etc), display icon (suggest President, State or Local Gov seal), play warning or watch alert tone per urgency code, scroll XML text if provided, and play audio / video stream.
  - System Test:
    a) When urgency code indicates test, play test alert tone and play test audio message once. (Tone and audio together run 5 seconds max.)
  - Response times: Watch / warning communications should be inserted into the programming stream within 1 minute. Test communications should occur within 5 minutes.
- *Local AM / FM / DAB Stations including those rebroadcast on Satellite Radio for local markets*.

  When less than 80% of signal coverage area is covered by Cell-/SMS-Broadcast warning system (Recommendation 18) or when Cell-/SMS-Broadcast system is non-operational (disaster damage, etc.), and so long as

less than 60% of homes and businesses in signal coverage area lack a 'fixed-site' Cell-/SMS-Broadcast receiver:

- Same as *Satellite Radio* except 2% of population and 5% of service area.

When 80% of signal coverage area is covered by Cell-/SMS-Broadcast warning system (Recommendation 18), and that system is operational (not limited by disaster or otherwise), and when 60% of homes and businesses in the signal coverage area have a 'fixed site' Cell-/SMS-Broadcast receiver:

- Same as *Satellite Radio* except 10% of population and 20% of service area and relaxed message repeat rate.

Percents of population and signal area, and repeat frequencies should be reconsidered after each new edition of the master plan (Recommendation 11).

Associations of service types should be allowed to propose service specific enhancements beyond the basic capability. But we recommend that where enhancements are recommended they be consistent within that service so sources of vital information are reasonably predictable by the public in disaster situations. It may be possible for some services to adopt some of the methods in the new warning system presented in Recommendation 22.

Recommendation 20: The FCC should mandate state and local interruptions. The EAS rules proposed above should minimize the interruption concerns cited in NPRM paragraph 24. Simple tones and concise message formats minimize message length. Tests are very short. The new warning system described in the next recommendation minimizes usage of EAS as deployment expands.

The ICS Internet and XML protocols, together, reduce the need for on-air EAS testing (NPRM paragraph 43). Computers of emergency information providers / originators could periodically could issue 'dummy' commands that cause remote destination computers to generate a response that confirms operation of the communications channel and remote computers. This kind of off-air testing could be nearly continuous. Fault-tolerant dual computer configurations could increase reliability even further. With these methods, on-air tests could be reduced to monthly or quarterly while gaining system reliability.

Recommendation 21: Regarding APAWS (NPRM paragraph 32) and PAW (NPRM paragraph 33), the FCC should favor a PAW solution and the addition of a particular APAWS (Recommendation 22). Most of the existing and alternate warning systems - Internet, telephone auto-dialer, fax blaster, etc. - try to adapt common consumer technology to public warning missions. They accept the limitations imposed by these devices. But these limitations translate into a lack of essential features per the list in Recommendation 5. And these missing features limit effectiveness.

Example: The recipient of a phone call cannot tell from the ring whether the content of the call – old high-school friend wants to chat, political campaign solicitation, or public warning.

We are not advocating total dismissal of existing warning systems, however. They have back up, mobilization, and other value in disaster management. All should be available and be used in the manner that best minimizes the consequences of individual emergency situations. It makes no sense to tie-up every phone line resource for public warning purposes and then not have the ability to mobilize the external resources needed for an effective disaster response.

Recommendation 22. The FCC should foster a new 'last-mile' public warning channel (NPRM paragraph 32). The unused Cell-Broadcast / SMS-Broadcast capabilities of GSM and CDMA cellular systems, respectively, provide a very suitable low bandwidth option. The author participated in a recent test of the GSM infrastructure and cell-phones in the US so that capability is known to be operational

Cellular carriers continue to make massive investments annually to expand coverage. And Cells on Wheels (COWs) with crank-up towers, generators and satellite antenna linkages can be towed or air-dropped for rapid recovery from major physical destruction.

At the present time, no alternative 'last-mile' channel offers so much opportunity to improve the effectiveness of public warnings so quickly. All of the attributes and features listed in Recommendation 5 can be met with this channel.

Cell broadcasting can provide strategic messaging in two ways. The simple approach transmits a warning through the one or more cells that encompass the affected area. In the second approach, a description of the affected area (polygon, ellipsoid, FIP) is attached to the warning message and this information is transmitted through all cells over a larger region as appropriate to the situation. The latter method allows people who have been dislocated by an event like a hurricane to be recalled by specific locale. It gives EMs more options in highly dynamic situations when they may need to change the warning for people who are already relocating out of the area. As GPS or other location capabilities are integrated into more cell-phones, the latter method becomes ever more appealing.

Cell-broadcasting is applicable to both 'fixed-site' devices for home and office use as well as mobility devices like 'smart phones' and automobile telematics. It's now entirely possible to achieve all desired features with dedicated warning / mobilization devices. Wall-cradle mounted and other 'fixed-site" variants can be built today with high-volume cell-phone chipsets and production lines. Only 4 buttons - silence alarm, scroll-up, scroll-down, delete message – would be needed for operation. And assuming that warnings were dispatched through all carriers, these devices could auto-roam across all networks for maximum signal redundancy and gap filling. These devices can easily drive highway signage, computer networks in large buildings, EAS decoders (demonstrated),

factory floor sirens, pillow vibrators and strobe lights used by people who are deaf (NPRM paragraph 22), etc.

Note in the previous paragraph that 'fixed-site' devices capable of driving EAS decoders and computers have already been demonstrated or pose simple communications interface issues. Even low power radio and TV station operators could afford to participate in a basic warning solution of this type. (NPRM paragraph 45)

Unfortunately, existing cell phones don't now provide all of the desired features cited earlier. Reception of cell-broadcast messages is generally delayed till voice communications is completed. People often turn-off phones during church services, concerts, meetings, and at night. Phones lack urgency coding mechanisms. Service contracts may limit roaming to carriers with inferior signal coverage in some areas.

Fortunately, we're not stuck long-term with these limitations. Some of the missing features like urgency coding are relatively simple to add to cell phones from a technical standpoint. A growing number of phones can be upgraded over-the-air or at automated service kiosks that already dispense ring-tones and games. Some new features will require national technical recommendations and a unified voice from the emergency management community. But cell-phone turn-over rates are high, so new features can reach general usage in a couple of years. And both of the strategic messaging methods cited earlier could be used together while legacy phones are phased-out.

Officials in several cities have indicated that if 'fixed-site' devices of this type were available, they would advocate building codes for them like smoke alarms.

With the new EAS rules proposed herein, Cell-/SMS-Broadcasting, 'fixed-site,' cell-phones and automobile telematics devices form a potent APAWS solution.

Recommendation 23: The FCC should favor an AWAPS solution that includes Cell-/SMS-Broadcast methods for ADA reasons per NPRM paragraph 36. The author tested rudimentary 'fixed-site' devices with people who are deaf and live in Marathon County, WI. These devices were well received. "They make me feel like part of the community." "I don't like needing special effort from [EMs] knowing it could delay help for someone else who is badly injured." Text-to-voice synthesis can be employed for persons with vision disabilities.

Note that a number of essential features listed in Recommendation 5 are conveniences to the 'temporarily able bodied' but are necessities for persons who are elderly or infirm. An EAS alert on the radio in the next room that affects another geographic area may be a annoyance to most of us, but for someone who cannot easily get out of their chair or move, they're a major burden that can put their life at risk (hip fracture from fall).

Cognitive issues are important factors. Message replay and simple device operation can be critical to message retention and personal decision-making. Many of these issues are

better addressed with Cell-broadcasting, particularly when devices like TVs, cable converters, etc. require configuration.

Recommendation 24: Regarding the warning language issues of NPRM paragraph 40, the FCC should again foster a cell-broadcasting based warning system. 'Smart' warning receivers can segregate and display a message in the preferred language from a data stream. These methods are not attractive options for analog communications services.

For many common emergency situations like tornadoes, warnings can be pre-scripted (may have to fill-in affected locale) in multiple languages. Computer translation of simple message is also feasible though automatic translations are sometimes clumsy. Message text in various languages can easily be tagged (XML protocol) for dispatched to the various 'last-mile' channels.

Recommendation 25: Regarding the partnership issue in NPRM paragraphs 22, the FCC should support a public / private partnership that is tasked with maintaining the master plan as science and technology advance. Historically, it has taken major crises to cause significant progress in emergency management technology. Readiness dictates a steady proactive approach.

The nation's emergency information highway straddles myriad governmental and private sector jurisdictions. A partnership is the only practical means to engage all stakeholders. It should be charged with updating the master plan and performance metrics every 5-years. And this master plan should include update and replacement horizons for all parts of the system. The partnership mission should also include technical standards, best operating practices, and identifying R&D needs.

Recommendation 26: Regarding NPRM paragraph 23, the FCC should favor Congressional-Chartering of the partnership so all federal agencies can actively participate without violating federal advisory committee statutes. All federal agencies have as part of their missions the issuance of warnings – food recalls, low altitude disintegration of asteroids (NORAD), homeland security intelligence, assuring public safety communications, etc. All views should be considered.

Recommendation 27: Again regarding NPRM paragraph 23, the FCC should insist on a partnership charter and bylaws that engage all stakeholders. While the views of all federal agencies need to be considered, federal agencies are just one of 8 categories of stakeholders in the nation's emergency information highway. Other stakeholders (Recommendation 2), particularly local EM agencies, have missions or interests in seeing that issued warnings are delivered.

Many stakeholders indicate they're not interested in participating in any program where federal interests can, and routinely do, trump the critical principles / operation practices cited above, or where the effort is politically driven. For full participation, partnership bylaws must assure:

- Each stakeholder category gets an equal vote(s) on executive board and final work product (votes of each category can be proportional to votes of respective stakeholder members),
- Stakeholder representatives are practitioners of respective stakeholder disciplines and elected by peers, and
- All work product is driven and defended by the critical principles / operating practices cited earlier.

DHS should have a lead role in the partnership (Recommendation 19) but only in the federal stakeholder category. We suggest that other federal agencies rotate through the other board positions allocated to the federal stakeholder category.

In this EAS rulemaking effort, collective federal views on EAS matters should be weighted equally with those of each of the other stakeholder categories. And per Recommendations 8 and 9, they should be considered within the context of the nation's emergency information highway rather than the EAS as a stand-alone system.

The charter should also mandate a survey of local EMs that grades each new master plan in terms of the critical principles and operating practices. The partnership and DHS should have to defend the plan with associated survey in Congressional hearings.

Recommendation 28: Assuming the partnership provisions above, the FCC should put on record its willingness to use the master plan as a primary guideline in future EAS rulemaking.

Recommendation 29: The FCC should decline the MSRC suggestion that the federal government coordinate development of a Media Common Alert Protocol (NPRM paragraph 34). Though MSRC's suggestions have merit, they should be addressed within the context of the master infrastructure plan (Recommendation 11) and by the partnership (Recommendation 25) that has representatives from all stakeholders.

Recommendation 30: The FCC should call for federal policies that encourage long-term and/or multi-state compacts for unifying and modernizing the nation's emergency information highway. Moneys for state and local agencies are now too fragmented to fully fix problems in the core EM processes - data gathering, information management, knowledge formation (situation analysis, visualization), and knowledge dissemination (public warning, external resource mobilization, etc.).

For reasons given in Recommendation 9, tax moneys are getting a poor return on investments in connectivity solutions. No one, particularly local EM agencies, gets any economy of scale benefits.

Limited markets make it very difficult for vendors to justify improvements at the rapid pace of technology or succeed over the long-term. The history of 911 computer aided dispatch software is filled with dead-ended products and abandoned business efforts. Technical support dissipates quickly. Worse yet, few of the many partial solutions are

interoperable. The factors above cause most local EM agencies to resort to lowest common denominator methods - sequential phone calls, paper maps, and legacy public warning systems.

A sustained applied-engineering program focused on fixing the core processes of EM and cost-apportioned amongst states is needed to truly solve public warning and other long-standing incident management problems. It will take a critical mass of money over a number of years to build a seamless emergency information highway. We suggest favoring 10% of domestic preparedness moneys for multi-state efforts. A modest additional federal contribution to pooled efforts would be a suitable inducement.

Closing Comments

We urge bold leadership in fixing the nation's emergency information highway that includes the EAS. The performance of existing public warnings systems, even when used collectively, is clearly inadequate. Incremental fixes of EAS rules and equipment standards will not be sufficient to allow general usage of new EM tools and methods by local EM agencies. These tools and methods are essential for dealing with major disasters, particularly catastrophic WMD events.

While hazard sensor technology – weather radar, etc. – has improved steadily, 'last-mile' technology has barely budged in the last 5 decades. This imbalance must be addressed with major revisions of EAS rules and operating methods and other steps. The consequences of major calamities like September 11, 2001 are simply too great to accept minor or 'quick fixes.'

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